REMARKS

Summary of Office Action

Claims 1-73 are pending in the above-identified patent application. Of those, claims 60 and 61 have been withdrawn from consideration as being drawn to a nonelected invention.

The Examiner has required applicant to elect one of three identified species.

The Examiner further made a request, in the form of eight (8) interrogatories, for information under 37 C.F.R. § 1.105.*

The Due Date of This Reply to Office Action

A shortened statutory period of one month/thirty days was set for reply to the election-of-species portion of the Office Action, while a shortened statutory period of two months was set for reply to interrogatory portion of the Office Action. This Reply to Office Action is being filed within the sixth month following the mailing date of the Office Action.

Accordingly, a four-month extension of time is called for in connection with the interrogatory portion of the Office Action, while a five-month extension of time is called for in connection with the election-of-species portion of the Office Action. Applicant has requested a five-month extension of time, and understands that that extension of time will subsume the four-month extension of time required in

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* There were nine (9) interrogatories identified by the letters "a" through "i." However, Interrogatory "g" is a sentence fragment, and during the telephonic interview of February 16, 2007, the Examiner indicated that Interrogatory "g" should be disregarded. This was confirmed in the February 26, 2007 Interview Summary.

connection with the interrogatories. If a separate extension of time is required in connection with the interrogatories, applicant hereby petitions for such separate extension, and authorizes the Director to debit Deposit Account No. 06-1075 for any fee associated with that petition.

Summary of Telephonic Interview

On February 16, 2007, the Examiner and the undersigned conducted a telephonic interview to discuss the Examiner's interrogatories. The undersigned wishes to thank the Examiner for the courtesies extended during the telephonic interview. The substance of the interview is accurately reflected in the Examiner's February 26, 2007 Interview Summary. Specifically, in response to inquiries from the undersigned, the Examiner advised that Interrogatory "g," which is a sentence fragment, should be disregarded, and the phrases "Brownian Motion" and "Brownian principal" [sic; principle], used variously throughout the interrogatories, should be considered synonymous.

Applicant's Reply to the
Election-of-Species Requirement

The Examiner has required applicant to elect one of the following species:

A. A financial system, typified by claims 15, 16, 31, 32, 44, 45, 50, 51, 54, 55, 58 and 59;

B. A biological system, typified by claims 62, 64, 66, 68, 70 and 72; and

C. A meteorological system, typified by claims 63, 65, 67, 69, 71 and 73.

Applicant hereby elects without traverse, for substantive examination in this application, Species A. Claims 1-59 read on the elected species.

The Examiner has indicated that claims 1, 22, 35, 49, 52 and 56 are generic. Applicant agrees, but respectfully

submits that claims 2-14, 17-21, 23-30, 33, 34, 36-43, 46-48, 53 and 57 also are generic -- i.e., that claims 1-14, 17-30, 33-43, 46-49, 52, 53, 56 and 57 are generic.

Applicant understands that in the event that a generic claim is allowed, a reasonable number of species will be rejoined to the application. Applicant believes that "two" is a "reasonable number," and therefore that all species should be rejoined in the event that a generic claim is allowed.

Applicant's Reply to the Request for
Information Under 37 C.F.R. § 1.105

The Examiner has made a request, in the form of eight (8) interrogatories, for information under 37 C.F.R. § 1.105.

Before the interrogatories are answered, a discussion of the term "Brownian Motion" is appropriate, because that term (or "Brownian principal" [sic], which, according to the Examiner during the telephonic interview, should be considered equivalent to "Brownian Motion") is used throughout the interrogatories.

In 1827, Robert Brown observed that pollen grains suspended in water moved for no apparent reason. He described this natural phenomenon, which has come to be known as "Brownian Motion," simply as the ceaseless movement of particles that go nowhere.

In 1863, Norbert Wiener proposed what has become the common mathematical model of Brownian Motion. That model assumes a fixed variance, and thereby leads to the derivation of a fixed mean -- a rate-of-ranging equal to the square-root-of-time.

Bachelier (1900), Einstein (1905) and H. E. Hurst (1913) all adopted the Wiener model. Furthermore, all of them promoted the idea that Brownian Motion was "random," and that view is generally held by most people today.

Applicant, on the other hand, believes that Brownian Motion is not random but contains useful informational content that can be measured. Applicant also believes the Wiener model is incorrect, because Brownian Motion is clearly nonlinear. However, applicant does believe that Brownian Motion centers on the square-root-of-time for the particular model disclosed in applicant's specification.

Based on that realization, applicant has developed a tool that accurately measures Brownian Motion. All others who have ostensibly based their work on Brownian Motion failed, at least because they assumed incorrectly that Brownian Motion was random and that it had a fixed variance which led to a fixed mean.

Applicant's Reply to Interrogatories

Interrogatory a

a. Is the Applicant aware of any application of Brownian Motion, in any field or regarding any subject matter, wherein a first range of data is compared to an expected range of data, wherein the expectation is based on Brownian Motion, which was known before the filing of the present application? If so, what are they?

ANSWER: Yes. Applicant knows of prior attempts to make comparisons to an expected range that were ostensibly based on Wiener's model of Brownian Motion.

Wiener and his followers (Bachelier, Einstein, Hurst, and Myron Scholes, for example) all made comparisons to an assumed fixed group mean equal to the square-root-of-time.

In the 1960s, Benoit Mandelbrot and Eugene Fama first drew attention to the nonlinear aspect of stock prices. That undermined the assumptions inherent in the Wiener model, and meant that that mathematical model was wrong. As a result, the above prior comparative attempts also were wrong.

The key is to measure the rate-of-ranging at a particular point in time without erroneously converting it to a group rate. The proper manner, as disclosed by applicant, retains and measures the irregularities, and does not filter or remove them by conversion to some uniform group standard which does not exist. It is the very nonlinear aspects others have assumed away that contain the informational content; and it is the individual time-period ranging rates that center on square-root-of-time.

One way to properly retain the informational content would be to measure the rate of ranging over n time periods, and divide it by the range in the first time period. In contrast, one way that prior attempts destroyed informational content (see, e.g., the discussion of Hurst and Mandelbrot below) included dividing the range over n time periods by the group's standard deviation.

<u>Interrogatory b</u>

b. Is Applicant aware of any application of Brownian Motion in the field of financial market assessment, before the filing of the present application? If so, what are they?

ANSWER: Yes. Bachelier, Fama, Mandelbrot, and Scholes each tried to apply Brownian Motion to the financial markets.

Bachelier (1900), adopting Wiener, found price-ranging on the French Bourse centered on square-root-of-time.

Paul Samuelson of the Massachusetts Institute of Technology obtained a copy of Bachelier's thesis in the 1950's and had it translated by Paul Cootner as <u>The Random Character of Stock Market Prices</u> (1964) (previously cited by applicant). This caused Mandelbrot (1963), Fama (1965) and Scholes (1971), to explore Brownian Motion in connection with stock prices.

Fama joined Mandelbrot in concluding that Brownian Motion was nonlinear. Both found volatility to cluster and

financial price distributions to be non-Gaussian with high peaks and fat tails (leptokurtotic).

Mandelbrot restated the Hurst Exponent, H (a term Mandelbrot himself created in 1968), as 1/H, called it a fractal, and tried unsuccessfully to apply Hurst's work to the stock market.

Scholes embedded the incorrect linear Wiener model into his Black-Scholes option pricing model.

All of these applications were based on the belief that Brownian Motion is random, and hence, devoid of informational content. No prior application has correctly extracted information from Brownian Motion before applicant's.

Interrogatory c

c. To the applicant's knowledge, has Brownian Motion been used to classify the variance in data of any system, before the filing of the present application? If so, how, and in what fields?

ANSWER: Yes. Applicant is aware of two prior approaches that have been taken in the past to classify data variance using Brownian Motion.

Einstein (1905) adopted and promoted the Wiener model that assumed even scaling in the variance of data. Specifically, he stated the distance a particle travels scales proportionately with the square-root-of-time (t). Thus, with m as a constant: $R = mt^{0.5}$

Hurst (1930s) attempted to classify the variance in water flow of the Nile River into three distinct states based upon Brownian Motion -- persistence, randomness, and anti-persistence. Hurst transformed the data into temporal segments, and then compared the scale of each segment with the number of segments. This so-called rescaled range (R/S) analysis showed uneven scaling.

Einstein's even scaling became the basis for the Black-Scholes option pricing model. Hurst's uneven scaling

became the basis for Mandelbrot's work and can be viewed on a Bloomberg financial terminal under the function KAOS.

Even scaling is wrong, as Brownian Motion has been shown to be nonlinear, whereby the input-output relationship is disproportionate. Uneven scaling is a correct depiction of Brownian Motion. However, Hurst measured uneven scaling incorrectly by grouping data into segments. Neither Einstein nor Hurst used Brownian Motion to properly classify the variance in data.

There is also a variant of the Hurst method, called alpha, which classifies the power spectrum of a time-series:

$$\text{Alpha} = 2H + 1$$

Practitioners in various fields refer to alpha as random "noise" and identify its spectral density by colors:

White noise has $H = -0.5$. It is said to be a random process with a flat power spectral density. It has been used in fields as diverse as architecture (acoustics), health care (sirens), and computer technology (random number generators).

Pink noise has $H = 0$. It occurs in many physical, biological and economic systems, and is often described as ubiquitous. In physical systems it is present in some meteorological data series, the electromagnetic radiation output of some astronomical bodies, and in almost all electronic devices. In biological systems, it is present in heartbeat rhythms and the statistics of DNA sequences. Also, it is the statistical structure of all natural images as discovered by David Field (1987).

Brown noise has $H = 0.5$. Named after Robert Brown, it is a signal equated with Brownian Motion.

Black noise has $H > 0.5$. It is said to be a characteristic of catastrophes like floods, droughts, bear markets, and various outrageous failures, such as electrical power failures. Black noise is further associated with disasters that come in clusters.

Colored noise, or alpha, is just another way to state the Hurst Exponent, H, and thus suffers from the same limitations.

Interrogatory d

d. To the applicant's knowledge, was it known at the time of the Applicant's invention that in a system, if a measured range of data is equal to a [sic] the range of data expected according to Brownian principal [sic] then the system is erratic, unstable, or unpredictable?

ANSWER: No. Prior classifications of data ranging at the square-root-of-time have been labeled as purely random. In contrast, applicant believes randomness does not exist and that informational content can be found at all rates of ranging.

Applicant refers to a square-root-of-time ranging as an inflection point - a point where a time-series can change its course and its elliptical shape (in two-dimensions) or its log-spiral shape (in three-dimensions). It is the point where "free will" has the most effect, and as a result, the output is most "erratic, unstable, or unpredictable." Nevertheless, the output will still be contained within the aforementioned shapes and will not be strictly random.

Interrogatory e

e. To the applicant's knowledge, was it known at the time of the Applicant's invention that in a system, if a measured range of data exceeds the range of data expected according to Brownian principal [sic] then the system is trending, accelerating, or growing?

ANSWER: No. Putting aside the inability of all prior attempts to properly measure Brownian Motion, either directly or for purposes of square-root-of-time reference, all prior attempts incorrectly classified the rate-of-ranging.

Prior to applicant, classification was a one-step process. The rate-of-ranging led directly to classification. Classification based on one, or even a limited group, of time-frames is incorrect. The system can only be said to be "trending, accelerating, or growing" when Brownian Motion as a whole is doing so. This explains, for example, why the Hurst Exponent provides only fleeting value at best.

Interrogatory f

f. To the applicant's knowledge, was it known at the time of the Applicant's invention that in a system, if a measured range of data is less than the range of data expected according to Brownian principal [sic] then the system is congesting, decelerating, or shrinking?

ANSWER: No. See Answer to Interrogatory e above.

Interrogatory h

h. Did applicant independently derive the conclusions of the difference in measured data and data expected based on Brownian motion, such as erratic, trending, or congesting variance, without any prior knowledge of such relationships? If not, what was known at the time of the Applicant's invention about said relationships?

ANSWER: Yes. Applicant derived the classification of measured data independently by, foremost, properly measuring the individual rates-of-ranging comprising Brownian Motion.

Prior attempts were wrong and confused. Brownian Motion is the end result, produced by an infinite number of expansion rates occurring in every conceivable timeframe. It is the culmination of a bottom-up process. Prior attempts from the top down have failed.

Interrogatory i

i. Does Applicant have knowledge of the term Hurst Exponent? If so, what relation, if any, does it have to Applicant's invention?

ANSWER: Yes, applicant has knowledge of the term "Hurst Exponent." However, Applicant's invention has no relation to the Hurst Exponent.

H. E. Hurst (1930s) was a hydrologist trying to model the Nile River. This was extremely complex as it encompassed numerous lakes, dams, storage reservoirs, and even different climatic regions. There is no evidence that Hurst solved the problem. What he did do, however, was to seek a shortcut.

Hurst grouped data -- his rescaled range analysis, R/S, looked across a segment of time. The numerator is the range of the cumulative deviation from the data's mean over the time segment; and the denominator is the standard deviation of the data range over the time segment.

The rescaled range, R/S, was then converted into a rate-of-ranging by expressing it as a number of data points raised to an exponent.

The term "Hurst Exponent," H, was coined in 1968 by Mandelbrot who named it after both Hurst and mathematician Ludwig Otto Holder. Mandelbrot revised Hurst's original 1951 formulation, but did not affect Hurst's main point -- that the range of river discharges and other natural phenomena grows more quickly than the square-root-of-time.

What Hurst observed and measured was the kurtosis of the time series distribution. As such, the Hurst Exponent is not really a calculation, but an estimation. It varies based on the amount of the data and the length of the time segment. Accordingly, it is a good example of why top-down modeling of Brownian Motion does not work.

The Hurst Exponent does show that predictability can exist in a time series, and the change in the predictability. However, it is not useful for prediction directly, anymore than the distribution of returns is useful for prediction. These statistics only analyze the behavior of a time series.

Applicant's invention measures the Brownian Motion scattering that culminates at a specific point in time, not across time. Applicant's invention is a bottom-up process that divides a particular ranging by an earlier initial range. It does not describe the population's distribution, but rather directly measures the Brownian Motion that produced a specific ranging effect.

Conclusion

An early and favorable action is respectfully requested.

Respectfully submitted,

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